

A new genus of toad (Anura: Bufonidae) from the Republic of South Africa with remarks on its relationships

Alice G. C. Grandison

Department of Zoology, British Museum (Natural History), London SW7 5BD

Hewitt (1926) described two small species of toads from the Cape Region of South Africa. He believed them to be closely related and distinguished them on the basis of size and the presence of an ear in the larger species, *Bufo tradouwi*. Both *B. tradouwi* and the smaller species, *B. rosei*, occur in the Cape Folded Mountain Belt, *tradouwi* being first described from the Swellendam Mountains and the Tradouw Pass at 1067–1676 m and *rosei* from the plateau above Muizenberg Mountain in the Cape Peninsula at 335 m, about 200 km to the west. In 1929 Power & Rose gave an account of the habits and life history of *rosei*, including a description of the eggs and tadpole. They stated that they believed *rosei* to be confined to the Cape Peninsula and quoted the vertical distribution of the species as 244 m at the southern tip of the Cape Peninsula, to 1006 m on Table Mountain. They referred to a juvenile collected at a band of shale at 1067 m in the Cedarberg Mountains (about 200 kms NNE of the Peninsula) as resembling *rosei* except for an indistinct tympanum being present and suggested that it may 'be a link between *B. rosei* and *B. tradouwi*'.

No further published reports appeared on these taxa until in 1964 Poynton synonymized them, believing that intraspecific variation could account for the loss of ear elements in *rosei*. Tandy & Keith (1972) resurrected *tradouwi* and, along with *B. garipeensis* Smith, *B. inyangae* Poynton and *B. amatolica* Hewitt placed it with the *angusticeps* Smith group, a group restricted to extreme Southern Africa and distinguished by them as 'small to medium sized toads having smooth skins, hypertrophied testes with a peculiar biochemical effect on eggs of other species when squashed and used in artificial crosses'. They placed *B. rosei* in a separate group but mentioned that its smooth skin and hypertrophied testes and its detailed anatomy and distribution in relict populations on mountain summits of the Cape Peninsula and Cape Folded Mountains suggest a closer affinity to the *angusticeps* group than to the earless *Bufo taitanus* Peters which they felt bore a superficial resemblance to *rosei*. Their reference to its detailed anatomy was not further explained nor did they elaborate on its resemblance to *B. taitanus*. The only published work on the osteology of *B. rosei* is one short paragraph (Martin, 1972) in which three dermal skull elements are described.

Like Tandy & Keith I could not accept Poynton's synonymising *tradouwi* with a species that in lacking middle ear elements has undoubtedly different ecological requirements, a different behavioural pattern as well as a more derived morphology. As part of my ongoing research into the comparative morphology of the osteocranium, vertebrae and myology of African bufonids material identified as *rosei* and *tradouwi* was examined. Results demonstrate that *tradouwi* is indeed distinct from *rosei*, that they are clearly distinguishable from each other by both external and internal morphological characters and that they are allopatric montane species with different but perhaps overlapping vertical distributions. They are separated geographically by the deep gap, the Nuwe Kloof, which divides the Bains Kloof Mountains from the Great Winterhoek Mountains, and by the Valley of the Breede River which stretches from the Tulbagh/Worcester valley southeastwards to Witsand on the south coast. *Bufo rosei* is confined to the area south west of this barrier, *Bufo tradouwi* to the Cape Folded Mountains to the north and east. The suite of characters possessed by *tradouwi* and *rosei* suggests that these Cape taxa are early derivatives from a stock that also gave rise to

Nectophrynoides and the Cameroun montane forest genera. Recognition of a new genus to accommodate *tradouwi* and *rosei* is proposed.

***CAPENSIBUFO* gen. nov.**

TYPE SPECIES. *Bufo tradouwi* Hewitt 1926 : 486.

CONTENT. Two species, *Bufo rosei* Hewitt and *B. tradouwi* Hewitt, found in the South-western Cape, Republic of South Africa.

DIAGNOSIS. (1) Small bufonids with rather smooth soft skin and scattered blister-like ridges and warts on the back and flanks. (2) Paratoids distinct, usually pear-shaped in *tradouwi* and inverted pear-shaped in *rosei*. (3) Ear present (*tradouwi*) or absent (*rosei*). (4) Toes without web, subarticular tubercles moderately developed, distal ones tending to divide, terminal phalanges simple, not expanded. (5) Tarsal fold absent. (6) A large subcircular, corrugated area post abdominally. (7) Vent ventral in sexually mature males of *rosei*, dorsal and terminal in females of both species and in male *tradouwi*. (8) Spinules in an axillary patch in breeding male *tradouwi*; nuptial pads on first and second fingers in adult males of both species. (9) Testes slender, cream, not hypertrophied in *tradouwi* 1/6 snout-vent length; broadly oval, twice as long as broad, heavily pigmented in *rosei* 1/4 snout to vent length. (10) Eggs pigmented, large (diameter 2.0 mm), clutches small (< 100). Head and body length of gravid females 27.0–33.6 mm (*tradouwi*) 29.0–32.5 mm (*rosei*). (11) Adult males of *tradouwi* larger than females (33.1–37.0 mm), smaller than females in *rosei* (21.3–27.8 mm). (12)

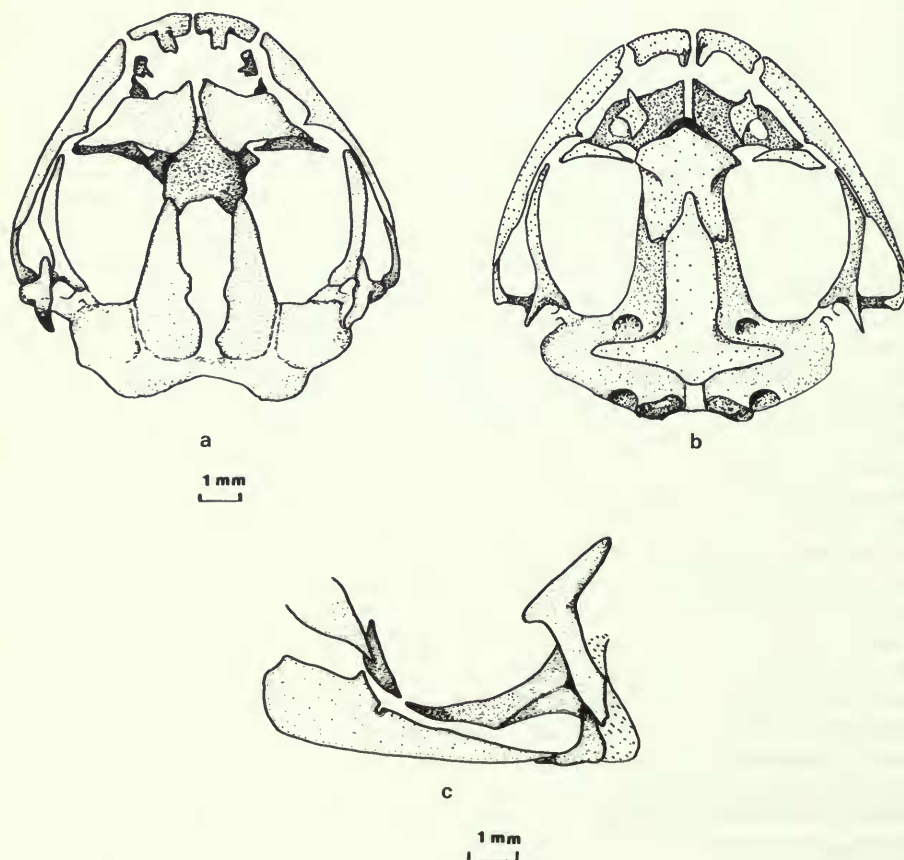


Fig. 1 Skull of *Capensibufo tradouwi*. (a) dorsal, (b) ventral, (c) lateral.

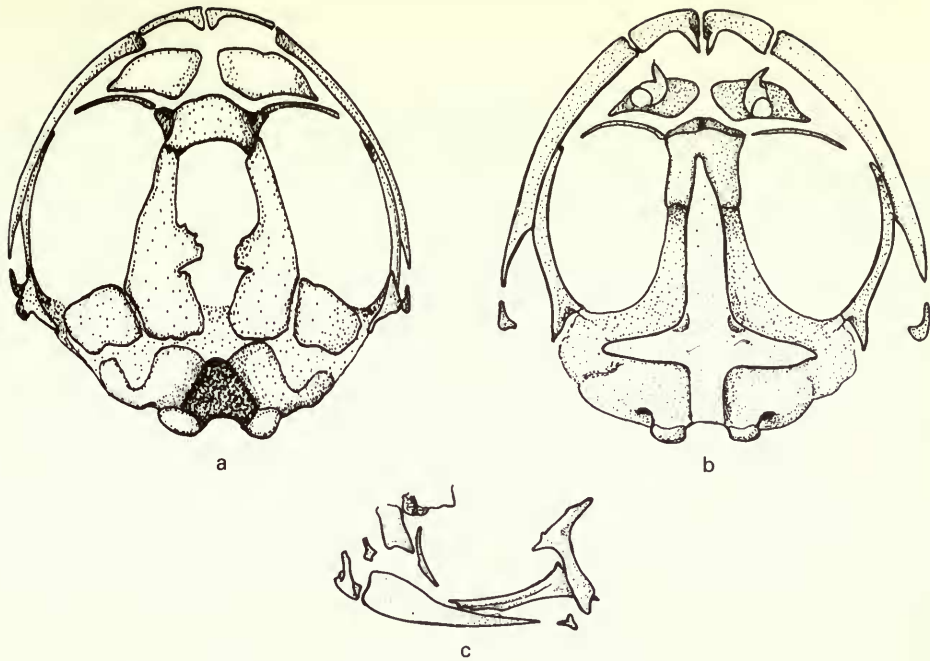


Fig. 2 Skull of *Capensibufo rosei*. (a), dorsal, (b) ventral, (c) lateral.

Omosternum present. (13) Adductor longus muscle present and long. (14) Tensor fasciae latae short, arises from distal 1/4 of ilium and inserts on cruralis muscle at mid thigh (*tradouwi*) or proximal 1/3–1/4 of thigh (*rosei*). (15) Iliacus externus muscle bulky, its origin on distal 1/2 of ilium (*tradouwi*) or moderately well developed and with a more extensive origin (*rosei*). (16) Large frontoparietal fontanelle. (17) Open occipital canal. (18) Squamosal shaft fully ossified. (19) Otic ramus narrow and long, an otic plate barely discernible. (20) Zygomatic ramus short. (21) Parasphenoid flat, devoid of keels, the cultriform process in *tradouwi* squat but tapering anteriorly where overlapped by sphenethmoid, in *rosei* longer and considerably slimmer. (22) Quadratojugal varies interspecifically; in *tradouwi* it meets both the quadrate and the maxilla, is narrowly overlapped by the latter and borders distal 1/2 of pterygoid fossa while in *rosei* it is vestigial and contacts neither the quadrate nor the maxilla. (23) Palatine reduced in both species, occasionally failing to meet sphenethmoid, separated from both the maxilla and pterygoid. (24) A large dorsal sphenethmoid exposure. (25) Nasals separated medially. (26) Medial ramus of pterygoid short, well separated from parasphenoid ala. (27) Preorbital processes well developed but not overlapping in anterior/posterior plane (*tradouwi*) or absent (*rosei*). (28) Occipital condyles/cervical cotyles narrowly separated (*tradouwi*) or widely separated (*rosei*). (29) Eight presacral vertebrae. (30) Sacro-coccygeal articulation bicondylar (*tradouwi*) or with a trend in *rosei* towards monocondylar.

ETYMOLOGY OF GENERIC NAME

Capensis: adjective relating to the Cape of Good Hope and to the phytochorological subdivision of the southern and western Cape Province.

Bufo: Latin for toad.

ECOLOGY AND HABITAT

The Capensis, the vegetation zone in which both *rosei* and *tradouwi* occur, has a distinctive and diverse flora and fauna with a high speciation rate. The dominant vegetation type is Cape fynbos, a term Taylor (1978) defines as being characterised by three elements—restioid, ericoid and proteoid—with rarely one species dominant. J. C. Greig (personal communication) believes that both species of *Capensibufo* occupy similar habitats and



Fig. 3 Locality records of *Capensibufo*.

describes a collecting area for *rosei* in the Klein River Mountains as a seepage marsh (adults with spawn obtained in July) and on a footpath where the vegetation is ericoid-restioid mountain fynbos with perennial seepage.

Power & Rose (1929) describe the breeding pool of *rosei* as an ephemeral puddle 4 x 2 ft and 4 inches deep, devoid of vegetation but with a muddy base. J. Visser (personal communication) describes the breeding pools as being rock pools of approximately 2 x 1 ft but because he did not distinguish *tradouwi* from *rosei* in the field and was unaware that the '*rosei*' material he collected at Pakhuis is actually *tradouwi* (specimens examined in present study) there is some uncertainty whether both species spawn in pools of similar size and substrate.

Remarks on likely origin of *Capensibufo* and its relationships

Taylor (1978) points out that the Capensis is so distinct that it is generally recognised as a floral kingdom on its own. Seven families of plants are endemic to the Capensis and he quotes Good (1974) as claiming that the Capensis may have the highest endemism in the world. The distinctiveness of both its flora and fauna is well documented and is thought to be attributable to its great age, its isolation spanning over 100 million years and its ability to survive climatic changes. Axelrod & Raven (1978) suggest that two major episodes of speciation took place in southern Africa, one in the Miocene and the second during the climatic fluctuations in the Pliocene and Pleistocene when the mountains were raised around the rim of South Africa. What is less clear is whether the ancestors of the Capensis herpetofauna migrated southwards from the montane forests of Central Africa, after Africa became isolated from Gondwanaland and drifted northwards, or whether they originated in South Africa as fragments of an ancient group that once was distributed throughout S.

America, Australia, Antarctica, India and Madagascar. I believe an austral derivation for the African members of the family Bufonidae accords more satisfactorily with the evidence that has accrued from my study of their osteology and some myological features, most of the southern African bufonids having a smaller number of shared derived character states than any Central African ones.

No present day African species of *Bufo* seems to be closely related to *Capensibufo*. Examination of 80% of the taxa currently recognised reveals that none has a rod-like otic ramus with only an incipient dorsal plate, none has an omosternum, none has marked reduction of the quadratojugal, none has reduced palatines, none has a frontoparietal fontanelle, none has a long iliocapsularis muscle and none displays a trend towards a modified arciferal condition in the pectoral girdle. But some or all of these characteristics of *Capensibufo* are met with in *Nectophryne*, *Laurentophryne*, *Wolterstorffina*, *Werneria*, *Nectophrynoides* and *Didynamipus* (Grandison, 1978 and in press), genera that I believe are derived from a common ancestor. It appears logical on the basis of an analysis of 24 osteological, myological and external characters which were selected as being potentially useful indicators of evolutionary trends to regard *Capensibufo* as an advanced derivative from this ancestor which while retaining the adductor longus muscle and the omosternum of the ancestor has evolved in isolation a number of derived character states chiefly through reduction of cranial elements. Further discussion of the relationships of *Capensibufo* and the analysis of characters is given in the forthcoming paper on *Didynamipus* (Grandison, in press).

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Capensibufo Study Material

rosei: 94 examples including 2 dry skeletons and 4 stained and cleared preparations. BM 1903.11.10.3-4, BM 1905.10.18.30, BM 1925.12.18.139-148, BM 1978.977-978, BM 1978.2237-2238, FMNH 187207-187265, FMNH 82692, FMNH 130946-130951, FMNH 166527, MCZ 10914-10916, PEM 101-102, SAM 19435(2), TM 26603, TM 26611, TM 52624.

tradouwi: 27 examples including 1 stained and cleared preparation. PEM 306, MCZ 98780-98781, SAM 14233, SAM 17389 (3), SAM 17854, SAM 18017, SAM 18188-18189, SAM 18192 (2), SAM 18303 (2), SAM 18341 (6), SAM 18345, SAM 18523, SAM 18783 (2), SAM 19439, SAM 20516-20517, SAM 43813, TM 52616, TM 52627-8.

Abbreviations used

BM	British Museum (Natural History)
FMNH	Field Museum of Natural History
MCZ	Museum of Comparative Zoology
PEM	Port Elizabeth Museum
SAM	South African Museum
TM	Transvaal Museum

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